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METEOROLOGY.—*Violent uprushes in cumulus clouds.* W. J. HUMPHREYS, Weather Bureau.

Every observer of clouds is familiar with the peculiar boiling and tumbling of large cumuli, their formation of new heads, and the other evidences they give of rapid motions and confused turbulence. And indeed the violence is much worse than appearances would indicate, if we are to believe the emphatic statements of the few balloonists who have survived the experience of such an aërial maelstrom.

As no such violent uprush is ever found in any other part of the atmosphere, one naturally asks what is there peculiar to the large cumulus cloud that produces this localized or exceptional result. And the answer, tho not obvious, should be indicated by a discussion of the processes involved in the formation of the cloud itself.

Let us assume the temperature of the atmosphere near the surface of the earth to be 30°C. and the relative humidity 42 per cent, and let ordinary vertical convection, resulting from this temperature, obtain up to the base of existing cumulus clouds—substantially the conditions that frequently obtain of summer afternoons.

Under the assumed conditions the temperature in the rising column decreases approximately at the dry-air adiabatic rate of 10°C. per kilometer from the surface of the earth up to the saturation level, 1.5 kilometers in the present case. At this level, however, because of the latent heat set free by condensation, there

is an abrupt change in the temperature gradient. At first it is rather under 5°C. per kilometer, and then as the elevation still further increases and the temperature steadily grows colder, so that less and less moisture condenses out per degree change, it grows greater, with, of course, the adiabatic gradient for dry air, or 10°C. per kilometer, as the limit towards which it approaches.

Now the ordinary summer temperature gradient in the free atmosphere, between the elevations of 1.5 and 8 kilometers, is approximately 6°C. Hence, in the assumed case, the temperature within the rising column will begin to increase above that of the surrounding atmosphere at the same level, as soon as condensation begins, and the temperature difference, together with the resulting buoyancy, will go on increasing with the elevation to a certain maximum and then decrease to a zero difference. In fact the inertia of the rising mass will carry it beyond the equilibrium level to heights where it will be colder and denser than the adjacent air, and from which it therefore must correspondingly fall back until final equilibrium of temperature and density are established.

Seemingly then the real cause of the violent uprush within large cumulus clouds is the difference in temperature between the interior of the clouds themselves and the surrounding atmosphere at the same level, due, as explained, to the change in the temperature gradient caused by the latent heat of condensation.

PHYSICS.—*The high frequency resistances of inductances.* L. W. AUSTIN, U. S. Naval Radio-telegraphic Laboratory. To appear in full in the Bulletin of the Bureau of Standards.

While the high frequency resistance of non-inductive resistances can be easily determined by substitution methods, the determination of high frequency resistance of inductances offers great difficulties. The decrement and half deflection methods,[1] in addition to being difficult to apply when very accurate results are desired, have also the disadvantage of including in the observed resistance all the sources of energy loss in the circuit. The present method, while laborious, seems capable of giving much more exact results than the others mentioned.

[1] Bulletin Bureau of Standards, **9**: 66. 1912.

The principle of the method is briefly the following: Two equal inductance coils are placed in identical oil calorimeters, one coil is heated by a high frequency current and the other by direct. When the calorimeters are both brought to the same temperature in equilibrium with their surroundings, the heat imparted to each per second must be the same. This heat is proportional to $I^2 R$ and the ratios of the resistances of the two coils at the given frequency and for constant current are inversely proportional to the squares of the currents.[2] To compensate for the slight inequalities in the coils and calorimeters, the direct and

TABLE I

Diameter of double silk covered copper wire = 0.04 cm.
Diameter of coils = 8.6 cm.
Turns of wire per centimeter = 18.9

COIL	LENGTH	TURNS OF WIRE	INDUCTANCE
	cm.		*m.h.*
1	0.60	11.0	0.022
2	1.10	20.5	0.066
3	1.55	29.5	0.115
4	2.65	50.0	0.273
5	3.75	70.5	0.475
6	5.40	102.0	0.775

high frequency currents are interchanged and the mean values of the ratios of the current squares taken. The high frequency current is produced by a rotary spark gap in an oscillatory circuit coupled loosely to the circuit containing the inductance coil to be measured. The two circuits are brought to resonance at the frequency desired, and the high frequency current thru the inductance, regulated by varying the coupling. The current is read on a non-shunted hot wire ammeter which has been accurately calibrated for high frequencies. The direct current for the other coil is supplied by a storage battery and the final regulation for equilibrium is made in this circuit. Equality of temperature between the two calorimeters is determined by a differential constantan copper thermoelement. The calorimeters are heated to

[2] See J. Zenneck, Elektromag. Schwingungen, p. 415, 1905, and J. A. Fleming, Principles of electric wave telegraphy, p. 124, 1912.

from 20° to 30° above the temperature of the room. The uncertainty of the individual high frequency current readings is approximately one part in fifty. The mean of thirty or more readings is taken as a basis for each calculation. The calorimeters provided with motor driven stirrers are of glass 15 cm. high and 10.8 cm. in diameter and contain sufficient petroleum to cover the coils under experiment. The coils of 0.40 mm. double silk-covered

TABLE II

COIL 1		COIL 2		COIL 3	
λ	R	λ	R	λ	R
m.	*ohms*	*m.*	*ohms*	*m.*	*ohms*
360	1.45	550	2.06	780	2.87
550	1.09	780	1.59	970	2.54
780	1.01	970	1.51	1150	2.20
970	0.72	1150	1.40	1440	2.02
D.C.	0.42	1440	1.31	1900	1.81
		D.C.	0.78	D.C.	1.12
COIL 4		COIL 5		COIL 6	
λ	R	λ	R	λ	R
m.	*ohms*	*m.*	*ohms*	*m.*	*ohms*
780	6.60	1440	7.75	1500	13.3
970	5.93	1900	6.55	2000	11.6
1440	4.65	2400	6.28	2500	10.9
1900	4.03	2900	5.93	3000	10.4
2400	3.52	D.C.	2.68	3500	9.6
D.C.	1.90			4000	9.1
				D.C.	3.88

copper wire are wound on glass, and the principal constants are given in Table I and their resistances in Table II.

After the determination of the resistance of the six pairs of standard coils a roller inductance of the Fessenden type was calibrated by comparison with the standard coils. The method used is as follows: A buzzer-driven wave meter is used to excite an oscillatory circuit containing a sensitive thermoelement and variable air condenser. By means of switches either one of the standard coils or the variable inductance can be inserted in this circuit, the deflections in each case being observed on the galvanometer of the thermoelement. Sufficient fine wire resistance is

then placed in series with the inductance giving the larger deflection and adjusted until its deflection is reduced to that of the other inductance. The resistance of the standard coil for the given frequency being known, the corresponding resistance of the variable inductance at this point is at once determined. When the variable inductance has been calibrated in this way for several points and at various wave lengths, it at once becomes a standard of comparison of resistance for any other inductances within its limits, by a method similar to the above. If the values of the resistances in Table II for any given wave length be plotted, it will be found that the results do not fall on a straight line, that is, the high frequency resistance increases more rapidly than in proportion to the number of turns of the coil. This result is not in accordance, I believe, with any of the various formulae which have been given for the high frequency resistance of inductances. The curvature appears, however, only in the first part of the curve. This is probably due to the distribution of the magnetic field.

MINERALOGY.—*The calculation of mineral formulas.* WALDEMAR T. SCHALLER, Geological Survey.

In the calculation of the ratios of a mineral analysis, it is customary to select arbitrarily one of the constituents as unity, or as some rational multiple of unity, and on this basis to calculate the ratios of the other constituents. As an example I will give the analysis of pearceite from the Veta Rica Mine, Sierra Mojada, Coahuila, Mexico, as recently published[1] by Frank R. Van Horn and C. W. Cook.

	ANALYSIS	RATIOS		
S	17.46	0.5444	10.80	11
As	7.56	0.1008	2.00	2
Ag	59.22	0.2744*	7.886	8
Cu	15.65	0.1231*		
Sb	0.00			
	99.89			

* Considered as (Ag_2) and (Cu_2) respectively.

[1] Amer. Journ. Sci. (4), vol. 31, p. 518, 1911.

The ratios are sufficiently close to 11 : 2 : 8 to show that these are the correct numbers. In reality the ratios are very much closer to 11 : 2 : 8 than the figures given by Van Horn and Cook suggest, as will be shown below.

The first column from the ratios given above is reproduced below (1) with the molecular proportions for silver and copper combined, and all the quantities multiplied by 100 for convenience of calculation. When the lowest number is taken as unity it is readily seen that the ratios are approximatly $5\frac{1}{2} : 1 : 4$. If the first figure be divided by 2 times $5\frac{1}{2}$ (these numbers are doubled to avoid fractions), the second by 2×1, and the third by 2×4, the figures under (2) are obtained. These numbers should be nearly the same. Their average is 4.986. If now the ratios obtained from the analysis be divided by this average value, namely 4.986, the figures given under (3) are obtained which are considerably closer to 11, 2, and 8 respectively, than the ones given by Van Horn and Cook.

	(1)		(2)	(3)
S	$54.44 \div (2 \times 5\frac{1}{2})$	=	4.949	10.92
As	$10.08 \div (2 \times 1)$	=	5.040	2.02
Ag_2,Cu_2	$39.75 \div (2 \times 4)$	=	4.969	7.97
		Av. =	4.986	

Ratios such as those given above under (3) are still too far from the whole numbers they approximate for comparison as they stand. The figures should be reduced to multiples of approximate unity which can then be directly compared, as follows:

S	10.92	=	$11 \times 0.99(3)$	=	11×0.99
As	2.02	=	2×1.01	=	2×1.01
Ag_2,Cu_2	7.97	=	$8 \times 0.99\,(6)$	=	8×1.00

These figures show that the ratios deducible from the pearceite analysis are in fact far closer to the whole numbers 11 : 2 : 8 than the ratios 10.80 : 2.00 : 7.886 given by Van Horn and Cook, which were obtained by arbitrarily selecting one of the numbers as unity. The form in which the last set of ratios is given above appears to express most accurately the relations derivable from the analysis.

BOTANY.—*Chaetospermum, a new genus of hard-shelled citrous fruits.* WALTER T. SWINGLE, Bureau of Plant Industry.

The wild relatives of the common orange may be divided into several rather distinct groups. One of these consists of the hard-shelled citrous fruits of which the best known representatives are the bael fruit, *Belou marmelos* (L.) W. F. Wight (*Aegle marmelos* (L.) Corrêa), and the wood apple of India (*Feronia elephantum*, Corrêa). These two were known to Rheede, Rumphius, Hermann and other pre-Linnean botanists as well as to Linnaeus himself.

A number of other plants belonging to this group are known to botanists. Four of them are natives of Africa and have come to light only recently. In the East Indies two species have long been known, but are little understood as yet. One of these, *Feronia lucida* Scheffer, grows in Java and is closely related to the wood apple of India. The other, the subject of the present note, was described in 1837 by Blanco, in the first edition of his *Flora de Filipinas*, under the name *Limonia glutinosa*. He saw it growing on Mt. Arayat, Province of Manila, Luzon Island, and noted that it was called *malacabuyao* or *tabog* by the Tagals.

In the second edition of his *Flora de Filipinas*, published in 1845, Blanco recognized that this plant was related to the wood apple and renamed it *Feronia ternata*.

About 1878, Andrés Naves, in editing a new illustrated edition de luxe of Blanco's *Flora de Filipinas*, recognized that the tabog was more nearly allied to the bael fruit than to the wood apple and accordingly transferred it to the genus Aegle making a new specific name *A. decandra*. In 1904 Merrill restored Blanco's original specific name, *Aegle glutinosa* (Bl.) Merrill.

An examination of the typical material in the Botanical Museum at Dahlem bei Berlin, made by the writer in June, 1911, showed *Limonia Engleriana*, Perkins, to be the tabog, as had been noted by E. D. Merrill on one of the paratypes.

In establishing a new genus, *Aeglopsis*,[1] from tropical West

[1] Swingle, Walter T., 1912, Le genre *Balsamocitrus* et un nouveau genre voisin, *Æglopsis*, in Bull. Soc. bot. de France (1911), 58 (mém. 8d): 225–245, figs. A, B, pls. 1–5 (March 2) also in Chevalier, Aug., Novitates florae africanae, fasc. 4, p. 225–245.

Africa, belonging to the hard-shelled citrous fruits, it became necessary to look up all the known plants of this group. This resulted in bringing to light a new species of wood apple from Indo-China, the type of a new genus[2] closely related to *Feronia*.

A reëxamination of the tabog, undertaken at the same time was facilitated by a fruiting specimen in the National Herbarium collected by E. D. Merrill (No. 3641, Concepción, Prov. Tárlac, Luzon, November, 1903), and showed that this species differs from *Belou marmelos* in flower, fruit, leaf and germination characters so profoundly that it must be put in another genus. The stamens of the tabog are ten in number, being twice as many as the petals instead of very numerous (more than four times as many as the petals) as in the bael fruit. The ovary of the tabog has 8 to 10 cells instead of 10 to 15 commonly found in the bael fruit. The fruit is oblong or long oval with low longitudinal ridges corresponding in number and position to the segments, and has a thick leathery rind. The bael fruit is spherical or pyriform, never ridged, and has a very hard, woody rind.

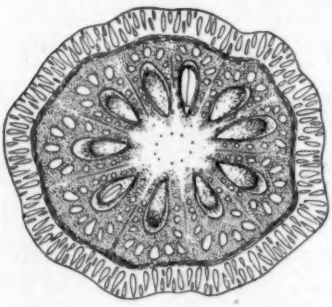

Fig. 1. Cross section of a fruit of *Chaetospermum glutinosa* (Concepción, Luzon, November, 1903, E. D. Merrill, No. 3641). Natural size. Shows the thick rind with long slender pointed oil glands; a thin intermediate layer; and an endocarp composed of spongy vesicular tissue (thickened ovary walls) surrounding the cells. The pith is not vesicular.

The cells of the tabog fruit are lined with a spongy tissue showing very large cavities or vacuoles. Nothing of the sort is found in any other of the hard-shelled citrous fruits (see fig. 1).

The leaves of the tabog are persistent instead of deciduous as in the bael fruit and have smaller, more rounded lateral leaflets. On germination the cotyledons become aerial in the tabog but remain hypogeous in the bael fruit.

Already in 1846 Roemer in his Synopses monographicae made a subgenus, *Chaetospermum*, under the genus *Limonia*, for this

[2] This will appear shortly in the Bulletin de la Société botanique de France

species, stating that he believed this to be the type of a new genus "-Typum novi generis certe format, ex ordine forsan excludendi."[3]

In view of Roemer's conviction that the plant constitutes a new genus it seems fitting to raise his subgenus to generic rank.

Chaetospermum (Roem.) n. gen.

Chaetospermum Roemer, M. J., 1846, Synop. Monogr. **1**: 39, as subgenus of *Limonia*.

Type species *Limonia glutinosa*, Blanco, M., 1837, *Flora de Filipinas*, p. 358.

A genus related to Belou, from which it differs in having persistent leaves with small rounded sessile lateral leaflets, fewer stamens (twice as many as the petals), fewer ovarial cells (8 to 10), an oblong ribbed fruit with a thick leathery rind and cells lined with a spongy tissue containing many large cavities or vacuoles (see fig. 1).

Leaves persistent, trifoliate, lateral leaflets small, sessile, usually less than one-third as long as the median, more or less blunt at the base or even rounded. Terminal leaflet gradually narrowed at the base. *Petioles* narrowly winged with a joint at the point of attachment of the leaflets. *Spines* slender, straight, sharp, in pairs at the axils or else one of the spines is replaced by a branch. *Inflorescences* axillary, composed of from one to several flowers on rather long, slender pedicels. *Flowers* perfect, 5-merous; calyx 5-lobed, petals 5, stamens 10, free. *Pistil* with a well developed style and a thick rounded stigma. *Ovary* with 8 to 10 cells, each containing numerous ovules. *Fruit*, oblong, longitudinally ribbed, with a very thick leathery rind, and with cells (filled with gum?) surrounded with watery tissue containing large cavities or vacuoles. *Seeds* numerous in the long narrow cells, flattened ovate, hairy. *Germination*—Cotyledons aerial, not increasing in size; first foliage leaves opposite, broadly ovate, subseriate, sessile, abruptly narrowed at base.

A small tree native to the Island of Luzon, Philippine Archipelago.

Chaetospermum resembles Belou in having trifoliate leaves, a many-celled ovary, and hairy seeds, but differs in many essential characters as noted above.

It agrees with Feronia in having aerial cotyledons which do not, however, show any increase in size during germination as in this latter genus. It agrees with Aeglopsis in having fruits with a leathery rather than a woody cortex, altho there are woody elements in the rind of an Aeglopsis fruit which seem to be lacking in Chaetospermum.

[3] Roemer, M. J., 1846, Syn. monogr. Fasc. **1**: 39.

Chaetospermum differs widely from all the other hard-shelled citrous fruits and constitutes a striking new genus. It undoubtedly belongs to the hard-shelled group of citrous fruits tho it alone does not (so far as known) have woody elements in the cortex.

Only one species is known; its synonomy is as follows:

Chaetospermum glutinosa (Blanco) n. comb.

Limonia Glutinosa Blanco, 1837, Fl. Filip. Ed. I, p. 358.

Feronia ternata Blanco, 1845, Fl. Filip. Ed. II, p. 252.

Ægle decandra, Naves, 1878 (?), in Blanco, Fl. Filip. Ed. III, pl. 124.

Aegle glutinosa (Blanco), Merrill, 1904, in Phillip. Gov. Lab. Bur. Bull. n. 6, p. 12.

Limonia Engleriana, Perkins, 1905, Frag. Fl. Phillipp. Fasc. III, p. 163.

Belou glutinosa (Blanco) Skeels, 1909, Bull. 162 Bur. Pl. Ind. Dept. Agr. p. 26.

Illustrations:

Naves 1878 (?) in Blanco, M., Flora de Filipinas, Ed. 3. vol. 2, pl. 124 (Lvs. fls. and fts.)

Vidal y Soler, S., 1883, Sinopsis de familias y generos de plantas leñosas de Filipinas, pl. 25, fig. J, 1–5 (Fls. fts. and seed).

Swingle, Walter T., 1912, Le genre Balsamocitrus, etc., l. c., pl. 5 (Young plant).

The tabog is a small tree native to the central part of Luzon, Philippine Islands. This species has been reported from the provinces of Tárlac, Pampanga (the type locality is Monte Aráyat in this province), Bataán, Manila, and Mórong. I have seen specimens from all of these provinces except Pampanga and Mórong, and have also seen a specimen in Herb. Kew collected by Vidal y Soler in 1886 at Angat, Prov. Bulacán. Young plants from one to three years old are now growing in the greenhouses of the Bureau of Plant Industry.

It has been found that oranges, lemons, grape-fruits, kumquats and other citrous fruits grow well when budded or grafted on such young tabog plants.

BOTANY.—*Chelonocarpus, a new section of the genus Annona, with descriptions of* Annona scleroderma *and* Annona testudinea. W. E. SAFFORD, Bureau of Plant Industry.

While on a mission for the United States Department of Agriculture, in April, 1902, Mr. Guy N. Collins of the Bureau of Plant Industry found at the railway station of Morales, not far from Puerto Barrios, Guatemala, a hard-shelled, globose custard-apple quite distinct from all Annona fruits hitherto known. He photographed two of the fruits, but was not able to secure flowers or leaves of the trees producing them. In February of the following year specimens of the same fruit together with herbarium specimens of the leaves were collected by Mr. Percy Wilson of the New York Botanical Garden near Puerto Sierra, Honduras, where the species occurred as a forest tree locally known as "Anona del monte," or wild Annona. One year later, in April, 1904, Mr. O. F. Cook collected fruits of a hard-shelled Annona very similar to the above species but oblate in form, broadly umbilicated and with the shell less regularly divided into polygonal areoles. At the same time Mr. Cook secured herbarium specimens including both leaves and flowers, the former differing somewhat in size and shape from those of the Honduras tree, tho of the same character, and the latter resembling the flowers of the section Atta, in shape, but with the receptacle and consolidated gynoecium so distinct as to further set apart the Guatemala species and its allies as a distinct group or section of the genus Annona. For this section I propose the name Chelonocarpus, suggested by the hard tortoiseshell-like surface of the fruit. On account of the complete nature of the material collected by Mr. Cook the species collected by him is made the type of the section.

Section Chelonocarpus

Hard-shell Custard-apple Group

Flowers in shape resembling those of the section Atta; peduncles clustered, usually issuing from the bark of old branches or stems (caulifloral); calyx gamosepalous, 3-lobed; receptacle (tor-

us) hemispherical or conoid, not clothed with hairs or bristles but with minute scale-like processes subtending the bases of the filaments in more or less vertical rows; corolla 3-petaled, the petals valvate, oblong or linear-oblong, the upper part triquetrous or keeled within, the lower part concave and swollen so as to include the essential parts; stamens with stout filaments bearing upon their back a pair of linear pollen sacs and terminating in an expanded minutely verrucose connective above them; carpels cohering firmly to form a solid gynoecium, with the outer ovaries minutely hirsute and the styles sharply articulated at the base and falling off soon after pollination has been effected; fruit (syncarpium) spheroid or conoid, composed of firmly consolidated one-seeded carpels inclosed in a thick rigid shell with the surface divided into rhomoboid or polygonal areoles by raised ridges; seeds smooth and glossy, oblong, somewhat compressed but not marginate, brown, or grayish brown to mouse-colored, surrounded by juicy pulp; leaves coriaceous, oblong, acuminate, with the midrib impressed above and raised beneath and the lateral nerves anastomosing before reaching the margin and connected by inconspicuous reticulating veins.

The species belonging to this section have been confused with the common custard-apple or bullock's heart (*A. reticulata* L.) and the chirimoya (*A. cherimola* Miller) from both of which they are easily distinguished by the large glossy seeds and the smooth, flat, coriaceous oblong leaves, as well as by the coherent nature of the gynoecium and the thickness of the rigid shell of the fruit. The two species here described may be broadly distinguished as follows:

Fruit oblate-spheroid in form, umbilicate; leaves not exceeding 9 inches (23 cm.) in length, abruptly acuminate..... *Annona scleroderma*

Fruit globose in form, not umbilicate; leaves sometimes 1 foot (30 cm.) long, gradually acuminate *Annona testudinea*

In addition to these species it is probable that *A. Pittieri* Donnell Smith, from southern Costa Rica, should be assigned to this section, as the character of its leaves and flowers would in-

dicate. Its fruit is described as conoid and its leaves do not exceed 18 cm. in length.[1]

Annona scleroderma sp. nov. Hard-shell Custard-apple. Box-té of Guatemala.

A vigorous tree. Young growth minutely ferrugineous-pubescent. Leaf-blades oblong, abruptly acuminate, rounded at the base, 14 to 20 cm. long, 5.5 to 6 cm. broad, coriaceous, glabrous when mature, when young minutely ferrugineous-pubescent beneath, dark-green above, becoming olive-green when dry, midrib impressed above and raised beneath, lateral nerves not conspicuous, the parenchyma between them finely reticulate and punctate; petiole 14 to 18 mm. long grooved above in continuation of the median channel, when young minutely ferrugineous-pubescent, at length glabrate. Peduncles extra-axillary, usually in clusters of 3 or more issuing from the bark of old branches (cauliflora) with a small ovate bracteole below the middle and one at the base, appressed ferrugineous-pubescent like the young growth, about equal to the petioles in length. Flowers cinnamon-brown, appressed puberulent, calyx gamosepalous, 3-lobed, 6 to 6.5 mm. in diameter, minutely ferrugineous-pubescent on the outer surface; petals 3, valvate, closely cohering in the bud, the upper part linear or linear-oblong and triquetrous, the base swollen and concave closely covering the essential parts of the flower; inner petals wanting (in all specimens examined); receptacle conoid or hemispherical, not clothed with hairs or bristles between stamens as in many other species but with minute scale-like protuberences subtending the bases of the filaments, disposed in distinct almost vertical rows; gynoecium about 4 mm. in diameter, composed of firmly cohering carpels 2.3 mm. long with the outer ovaries clothed with appressed glossy rufous or chestnut-colored hairs; styles ovate to oblong, sharply articulated at the base, turning black and soon falling off after pollination has been effected; stamens 1.7 to 1.8 mm. long, with the stout filament light-yellow mottled with orange-red, and the swollen connective above the pollen sacs minutely verrucose, as seen under the microscope. Fruit depressed-globose, or oblate, broadly umbilicate, the surface of the thick rigid shell divided into angular areoles corresponding to the individual closely-cohering carpels by raised obtuse ridges; seeds oblong to oblong-obovate, somewhat compressed but not marginate, about 2 cm. long and 1 cm. broad, with the testa smooth and glossy, at length chocolate brown, endosperm ruminate, with the minute embryo embedded in its base; pulp juicy, not adhering to the seeds, pleasantly aromatic, with mango-like flavor, edible.

Type in the U. S. National Herbarium, No. 850041, collected at Cahabon, state of Alta Verapaz, Guatemala, April 20, 1904, by O. F. Cook (No. 89). Distribution: Mountains of Alta Verapaz, Guatemala, across the boundary into Mexico and as far north as Oaxaca.

[1] *A. Pittieri*, Donn. Sm., Bot. Gaz. **24**: 389. 1897.

EXPLANATION OF FIGURE 1. A cluster of unopened flowers, leaves, fruit, and seeds of *Annona scleroderma* natural size; and the torus marked with vertical rows of stamen-scars and bearing the cohering mass of carpels (gynoecium), enlarged 3 diameters. Drawn by Mr. J. M. Shull.

In addition to the type material, seeds sent in 1910 by Prof. Felix Foex to the U. S. Department of Agriculture from the state of Oaxaca belong very probably to this species (Seed collection No. 29316). In a note accompanying them Prof. Foex writes as follows: "These seeds came from a very interesting fruit of good size, good shape, pretty appearance, and having large seeds: the skin is thick as the shell of a coconut but not so hard; it resists well a pretty hard shock and pressure, and would be very good for packing and shipping."

Mr. O. F. Cook in his field-notes made the following entry: "The fruit called by the Kekchi Indians of Alta Verapaz box-té, or bosh-té, is curious rather than beautiful. The shell is divided into angular depressed areoles by raised ridges. When mature the ridges are dark brown and the areoles between them green. The pulp is readily separable into slender pyramids. These are normally 1-seeded, but in many cases they are seedless. The texture of the pulp is perfect, the flavor aromatic and delicious with no unpleasant aftertaste. It is much richer than the soursop, with a suggestion of the flavor of the zapote blanco, or matasano (*Casimiroa edulis*), but not in the least objectionable. It can be eaten most conveniently with a spoon. The most fragrant pulp is close to the rind. The seeds separate from the surrounding pulp more readily than in most annona fruits."

Fig. 3. Seeds of *Annona testudinea*, *a*, compared with seeds of *A. reticulata*, *b*, with which the present species has hitherto been confused.

Annona testudinea sp. nov. Tortoiseshell Custard-apple. Anona del Monte of Honduras.

A forest tree 12 to 15 meters high. Leaf-blades oblong or oblong-elliptical, acuminate at the apex, abruptly cuneate or rounded at the base and usually decurrent on the petiole, those near the base of branch sometimes retuse or rounded at the apex, as in the case of many other species of Annonaceae, 25 to 35 cm. long and 7.5 to 9 cm. broad, coriaceous, smooth and flat with the midrib impressed above and very prominent beneath; lateral nerves not prominent, connected by inconspicuous anastomosing veins; petiole rather long (22 to 25 mm.), at length glabrous, grooved above. Flowers not observed. Fruit globose, hard-shelled, 8 to 9 cm, in diameter, its surface divided into polygonal areoles by raised ridges, suggesting tortoiseshell in its general appearance. Seeds 20 to 22 mm. long and 10 to 12 mm. broad, sometimes elliptical in cross-section or slightly compressed with one or both edges sharp-cornered but not marginate, testa smooth and glossy, light-brown or

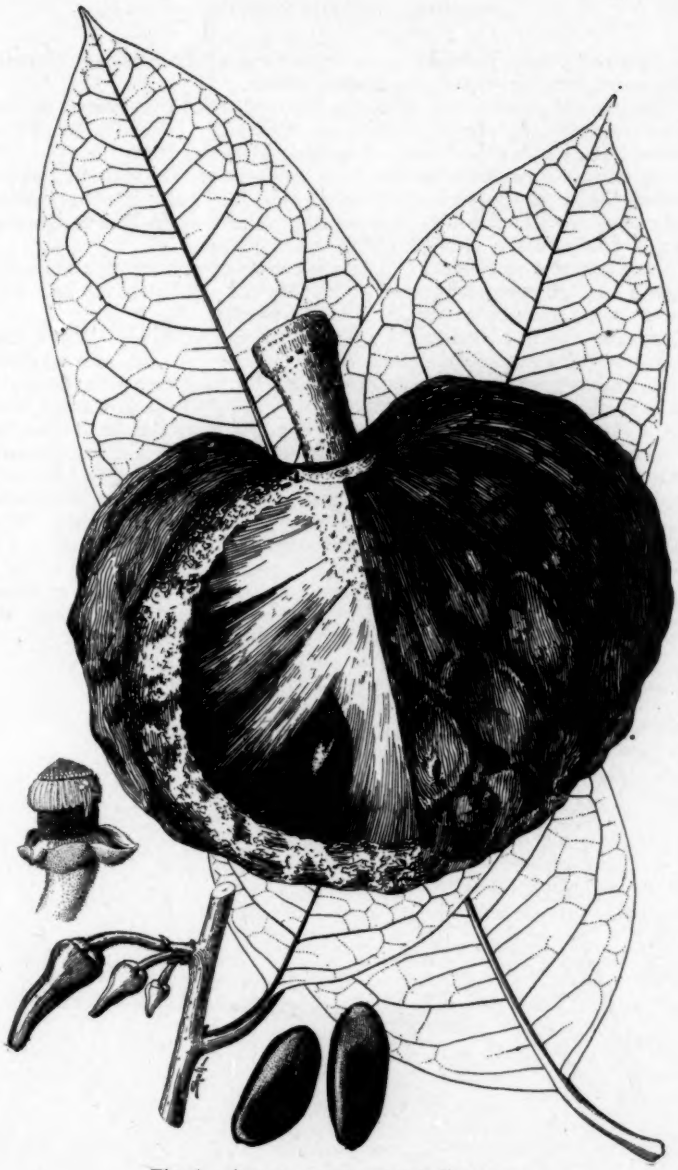

Fig. 1. ANNONA SCLERODERMA SAFFORD.

mouse-colored, faintly revealing the transverse wrinkels of the ruminate endosperm; pulp very juicy, aromatic, edible.

Type in the Herbarium of John Donnell Smith, collected in the forest near Puerto Sierra, Honduras, February 7, 1903, by Percy Wilson (No. 351). Specimens examined: Material from the type collection in the Herbarium of the New York Botanical Garden and the Donnell Smith Herbarium, Baltimore, Maryland; also photographs of fruits purchased at Morales, Guatemala, not far from Puerto Barrios, April 6, 1902, by Mr. Guy N. Collins (No. 3833).

EXPLANATION OF FIGURE 2. *Annona testudinea*, from type material, natural size, showing a typical acuminate leaf and a basal leaf with retuse apex. Drawn by Mr. Ivan M. Fitzwater.

The fruit, as described by Mr. Collins in his field notes, "has a shell about one-eighth of an inch thick, which breaks with almost a fracture, with a fleshy core [receptacle] reaching from the base nearly to the center of the fruit. The pulp of the ripe fruit is rich, soft, and watery, with only a faint suggestion of the sandiness noted in the Annona observed at Sepacuité [*A. reticulata* L.], very aromatic and with a slight pine-like flavor, turning brown when perfectly ripe and not adhering to the seeds. The color of the outer surface is grayish or bluish green, somewhat pruinose, becoming purplish at maturity." According to Mr. Percy Wilson, the fresh leaves are dark green above and paler beneath. The tree, known locally as "anona del monte," or wild custard-apple, is highly esteemed by the natives for its fruit. The latter is green-ridged with brown seeds having the odor of turpentine when cut, and with good edible pulp, which is easily separable.

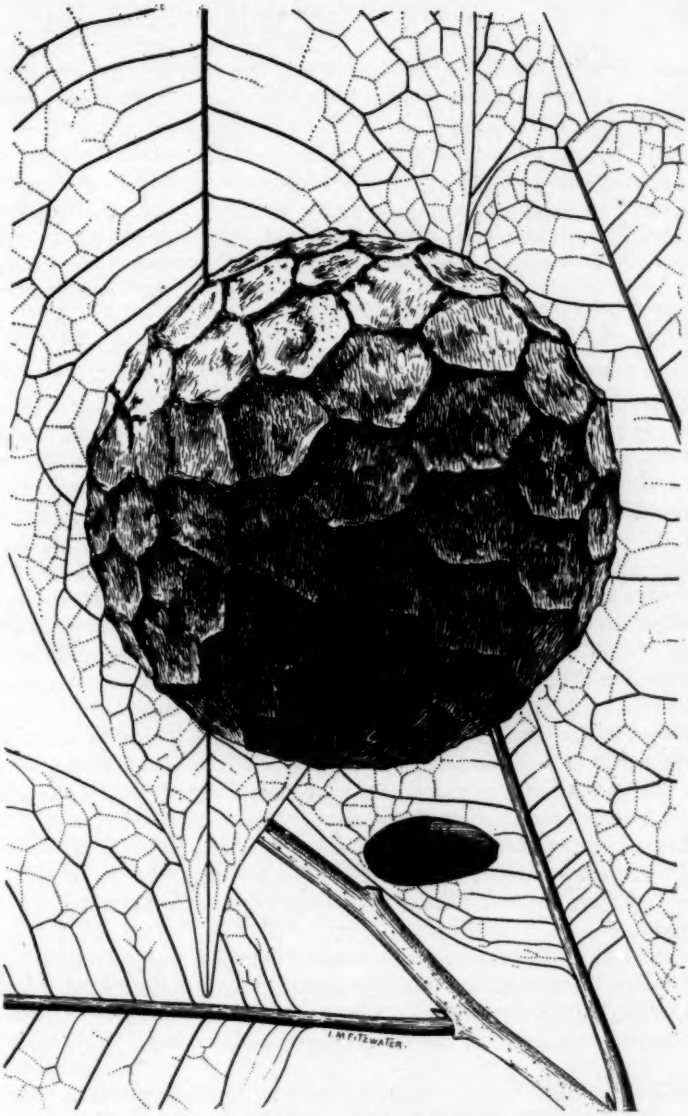

Fig. 2. ANNONA TESTUDINEA SAFFORD.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

ASTROPHYSICS.—*Report on the astrophysical Observatory, Smithsonian Institution, for year ending June 30, 1912.* C. G. ABBOT.

The year has been notable for expeditions to Algeria and California to test the supposed variability of the sun by making simultaneously at these two widely separated stations spectrobolometric determinations of the solar constant of radiation. The measurements in Algeria agree with earlier ones at Washington and Mount Whitney and indicate that Mount Wilson values are systematically a little low. Apart from this systematic error the average accidental differences between Algerian and Mount Wilson determinations were only 1.2 per cent, indicating an average accidental error of a single solar constant determination at one station of only 0.9 per cent. So far as yet reduced, high solar constant values obtained in Algeria coincide with high values at Mount Wilson and vice versa. A solar variation of 4 per cent was indicated at both stations in the first half of September, 1911. Many values remain to be computed, but it can now hardly be doubted that the outcome will prove conclusively the irregular short-period variability of the sun.

Numerous copies of the silver disk pyrheliometer have been standardized and sent out, mainly to foreign governmental meteorological services.

Valuable results have been secured in the research on the transmission of radiation through atmospheric water vapor. An accurate method of estimating the total water vapor contents of the atmosphere between the observer and the sun has been devised by Mr. Fowle. C. G. A.

METEOROLOGY.—*Atmospheric studies.* J. W. SANSTROM. Bulletin of the Mount Weather Observatory, **5**: 3–51. 1912.

The first part of this paper is devoted to a number of fundamental or general principles in meteorology, all of which are minutely and clearly

explained. The second part treats of the vortex movements of the atmosphere, and is by no means such easy reading as the first part.

The author made the observations upon which his article is based during the winter and in the mountains of Sweden, and hence under exceptionally favorable opportunities for the study of air movements. A comparatively warm ocean was on one side of him and a cold continental area on the other, so that he himself was on the inside, as it were, of a gigantic heat engine where he could see and experience all that was taking place.

Among other things, an account is given of the movements of the wind as it blows across regions covered by fine loose snow. In this case the lower air, to the depth of 20 to 50 meters, becomes filled with the snow in the same manner that it becomes filled with dust when blowing over a desert. Now the snow obviously increases the density of the stratum of air it is in, and hence this particular stratum moves up the windward side of a mountain or other slope comparatively slowly and then, as soon as it has passed the crest, flows down the leeward side with great violence. In one observed case, this rapidly falling loaded air set up great surging billows in the atmosphere at the foot of the mountain that lasted for hours, with only 10 to 15 minute intervals between perfect calm and hurricane violence, and that were felt to a distance of 140 kilometers from their place of origin.

The second part of the paper begins with a general account of vortex motion which the author makes clear by the aid of drawings and numerical calculations applicable to simple cases. The principles thus established are then applied to the vortices of the atmosphere of which there are two distinct types: Those which are roughly circular and symmetrical, with their vortex filaments nearly vertical, and those which are very unsymmetrical with horizontal filaments. The first obviously applies to whirl-winds, tornadoes and the like, and is relatively simple, while the second concerns approximately horizontal circulation with an upper and a lower current flowing in opposite directions. This is called a "gliding" vortex and the plane separating the oppositely directed currents a "glide" plane. It is further explained that in general the "glide" plane is more or less inclined, and suitable equations are developed for the computation of the rate at which energy is being transformed in such a vortex.

A remarkable example of the "gliding" vortex commonly occurs during the winter along the coast of Norway. Here a cold east wind flows down the mountains and onto the ocean with great violence, while

at an elevation of about 1 kilometer a relatively light and warm counter current flows to the east. In reality this is a "land breeze" on a very large scale, so large indeed that per kilometer of coast-line heat energy is converted into wind energy frequently at the rate of 45 million horse power! W. J. HUMPHREYS.

TERRESTRIAL MAGNETISM.—*A new type of compass declinometer.* R. L. FARIS. Journal of Terrestrial Magnetism and Atmospheric Electricity **17**: 109–114. 1912.

This paper describes a new form of instrument for ascertaining the magnetic declination at stations where the true bearing to some other point is already known, and is especially adapted for use of general survey parties when working in remote regions, such as Alaska or the Philippines, where it is possible at nominal cost to ascertain the magnetic declination much in advance of the possibility of a general magnetic survey.

Experience in the Coast and Geodetic Survey and elsewhere has shown that acceptable magnetic declination results can be obtained with pivot suspension needles. The instrument is described as follows:

It is essentially a compass needle enclosed in a rectangular needle box with peep sights, which is rigidly mounted on a graduated horizontal circle. The needle lifter and some of the other details are novel and have been worked out with great care. The base rests on three leveling screws and has double centers of brass. The horizontal circle, which is 152.4 mm. in diameter, is read by two verniers to single minutes of arc. The needle is mounted in a rectangular box the inside dimensions of which are 164 mm. long, 31.5 mm. wide, and 17 mm. deep. This box is secured to the cover plate of the horizontal circle. At each end of the box is a graduated arc (arc graduated to 10 minutes), about 10° in extent on each side of the zero in the middle. Vertical peep sights, 40 mm. high, are attached to the ends of the box so that the zeros of the graduations, the needle pivot and the peep slits are in the same vertical plane. The top edge of the needle is straight, its ends and the apex of the agate cup suspension being in a straight line. The needle lifter is of special design and direct acting, and so arranged that the instrument cannot be packed in its packing case without first lifting the needle off its suspension pivot. When the needle is raised off the pivot it is held firmly in place between the lifter and a flat brass spring in the top of the needle box. The needle and horizontal circle readings are made with the aid of three reading microscopes. The instrument is leveled by means of an adjustable circular level mounted on the cover plate of the horizontal circle. The needle is 148.5 mm. long and is made of "magnet steel;" the dimensions of its cross-section are 0.6 mm. by 3.5 mm. The width of the peep-sight slits is 0.5 mm.

Upon testing this instrument under actual field conditions it was found that the needle, on account of its rather unusual length, required too frequent readjustment of balance. As a remedy for this inconvenience the point of suspension (agate cup) has now been raised, likewise the ends of the needle have been bent upward to bring them again in line with the suspension point. R. L. F.

PHYSICS.—*On the density of solid substances, with especial reference to permanent changes produced by high pressures.* JOHN JOHNSTON and L. H. ADAMS. Journal of American Chemical Society, **34**: 563–584. 1912.

With a new and improved form of pyknometer the density of salts and other substances has been determined with an accuracy of 3 or 4 units in the fourth decimal place, that is, within 0.02 per cent. In many cases, however, such accuracy is unnecessary, since the variations of density due to inhomogeneities of the material may be much greater than this.

Powdering a crystalline substance does not change its density by an amount which we can detect with certainty, provided that the material is homogeneous and free from cracks and holes; but if the substance is not homogeneous, then, as might be expected, the fine powder is denser than the coarse particles.

Neither does very high hydrostatic pressure produce any after-effect on the density of strictly homogeneous crystalline compounds.

But if the pressure be not uniform, then the density of a metal which has been subjected to such compression—or has been deformed in any other way—usually increases first (owing presumably to the filling up of pores and cracks) and then decreases, sometimes even so as to reach a final density less than the original value. Subsequent annealing of the specimen causes a renewed increase of density. The direction of the change of density on compressing bismuth is, contrary to Spring's conclusion, the same as that for other metals, namely a decrease of density, following upon deformation. The bearing of these results upon the question of the "flow" of metals is discussed: they are shown to be in harmony with the idea that the "flow"—or indeed any deformation—of a metal is a manifestation of a real melting produced by the unequal strains set up during the process.

Finally, it is important to emphasize the fact the density of most substances is somewhat variable, owing to a lack of complete homogeneity of the material. In consequence of this, slight changes of density

can not be regarded as good evidence for the occurrence of any transformation or chemical reaction, whether produced by subjecting the system to compression or by other means. J. J. and L. H. A.

PHYSICS.—*Mixtures of amorphous sulfur and selenium as immersion media for the determination of high refractive indices with the microscope.* H. E. MERWIN and E. S. LARSEN. American Journal of Science, **34**: 42–47. 1912.

Fused mixtures of sulfur and selenium are glassy when cold. By standardizing the mixtures with respect to their refractive indices by measurements on prisms molded into the angle between glass plates, they can be used to match the refractive indices of suitable substances immersed in them and studied under the microscope. A chart showing the refractive indices of various mixtures for several wave-lengths has been prepared, and a method of interpolating values of refractive indices, obtained by using a monochromatic illuminator, explained H. E. M.

GEOCHEMISTRY.—*The sulfides of zinc, cadmium, and mercury; their crystalline forms and genetic conditions.* E. T. ALLEN and J. L. CRENSHAW. Microscopic study by H. E. Merwin. American Journal of Science, **34**: 341–396. 1912.

The sulfides of zinc are enantiotropic, with an inversion point at 1020°. Sphalerite is the stable form below this temperature, wurtzite above. Their indices of refraction, dispersion, and specific gravities were determined. Iron in the form of ferrous sulfide is present in solid solution in the ferruginous sphalerites, since the specific volume, index of refraction, and inversion-point change continuously with increasing percentage of iron. Sphalerite was formed synthetically by action of alkali sulfides on zinc salts at 200° and above. Wurtzite was obtained by action of hydrogen sulfide on solutions of zinc salts containing free acid at temperatures between 250° and 350°.

Only one crystalline form of cadmium sulfide was obtained. It is identical with the mineral greenockite. Crystallographic and optical measurements and determinations of specific gravity were made on a very pure synthetic preparation.

Besides cinnabar, a black sulfide of mercury, probably identical with metacinnabar, and a new form, hexagonal, but with properties distinct from cinnabar, were obtained. Cinnabar is the stable form; the other two are monotropic forms.

The most interesting result for geochemistry which was obtained in these synthetic studies was the following: The unstable crystalline forms, metacinnabar, wurtzite, and marcasite, are obtained only from acid solutions, while the corresponding stable forms, cinnabar, sphalerite, and pyrite, are the only product of alkaline solutions, tho they may be obtained from acid solutions also. E. T. A and J. L. C.

PETROGRAPHY.—*Microscopical petrography from the quantitative viewpoint.* FRED. EUGENE WRIGHT. Journal of Geology, **20**: 481–501. 1912.

In this paper attention is directed to the importance of good quantitative work in microscopical petrography which has now passed the qualitative, reconnaissance stage of its development and is entering upon large problems, essentially quantitative in nature, which require precise data of observation for their solution. The different optical properties used in the determination of minerals are classified in detail and simple effective methods are briefly described which experience has shown to be well adapted for the determination of the different optical constants of mineral plates and grains. F. E. W.

PETROGRAPHY.—*Petrographic study of the specimens of loess, tierra cocida, and scoria collected by the Hrdlicka-Willis Expedition.* FRED. EUGENE WRIGHT and CLARENCE N. FENNER. Included in the volume, Early man in South America, by Ales Hrdlicka in collaboration with W. H. Holmes, Bailey Willis, Fred. Eugene Wright, and Clarence N. Fenner. Bulletin, Bureau of American Ethnology, Smithsonian Institution, **52**: 55–98. 1912.

This collection was found to contain several extraordinary rock types, and for the solution of the problems which they present, three distinct lines of attack were followed: (1) the usual detailed petrographic-microscopic examination of the rocks; (2) chemical study of the different rock types; (3) thermal study of the specimens at different temperatures and comparisons of the products thus obtained with the natural products.

The *loess* consists in large measure of volcanic and eruptive material. Salic volcanic glass is present in practically every specimen and may become so abundant that it constitutes 90 per cent of the whole. The minerals are remarkably fresh and unaltered, while the amount of argillaceous material present is relatively small in most of the specimens. These facts may be considered indicative of tremendous and

widespread volcanic activity of the explosive type during or just preceding the formation of the loess.

The specimens of *tierra cocida* are composed, for the most part, simply of loess fragments which have been indurated and reddened by heat action, between 850° and 1050°. The loess and tierra cocida are similar in general character and composition.

The *scoriae* are not normal volcanic scoriae. They have been produced by the melting down of an original clastic material (loess) under conditions which protected the molten mass from oxidation. The hypothesis is advanced that the loess formation was intruded by igneous masses which melted down the adjacent loess and formed the present black scoriae. The lack of oxidation of the scoriae and their abundance in the field precludes the possibility that they were formed by the melting down of loess by bonfires or any type of fire in the open air. Prehistoric man is not, therefore, responsible for their occurrence.

F. E. W and C. N. F.

PETROLOGY.—*Study of a contact metamorphic ore-deposit. The Dolores mine, at Matehuala, S. L. P. Mexico.* J. E. Spurr, G. H. Garrey, and Clarence N. Fenner. Economic Geology, **7**: 444–484. 1912.

This is a study of an interesting problem in applied geology, toward which the laboratory contributed an exhaustive petrographic investigation of the various types of rock which had been collected in the field. The problem comprised the study and elucidation of the phenomena of an unusual type of metamorphism and ore-deposition, associated with and consequent upon the intrusion of a great mass of eruptive rock into a series of sedimentary beds. In conjunction with the field-work a collection of typical rock-specimens was sent to the laboratory. From these the field relations which had been observed were confirmed and supplementary information obtained. From the different sources of information thus made available it was possible to arrive at well-grounded conclusions regarding the geological history of events, including the sequence of mineral deposition, the nature of the circulating solutions, and the relations existing between the metallic sulfides and the gangue minerals.

C. N. F.

GEOLOGY.—*Apishapa, Colo., Folio.* GEORGE W. STOSE. Folio No. 186, Geologic Atlas of the United States, U. S. Geological Survey. January, 1913. Topographic, geologic, and structure maps, and sheet of illustrations.

The Apishapa quadrangle is one-quarter of a square degree situated 20 miles southeast of Pueblo, Colorado. It was geologically surveyed by G. K. Gilbert and his assistants some years ago and was recently completed and revised by G. W. Stose. The topography of the quadrangle is typical of the semiarid Great Plains region, comprising rolling treeless plains, low mesas, and deep rocky canyons. An old dissected peneplain, drainage modifications, and other physiographic features are discussed and figured. The rocks exposed are all of Cretaceous age except the oldest rocks observed in some of the deeper canyons—the Morrison formation of possibly Jurassic age—and the surficial gravels of Tertiary and Quaternary age. Lower Cretaceous rocks are recognized and mapped for the first time in this vicinity as the Purgatoire formation. The structure of the quadrangle is a sharp dome-like uplift centering in the Rattlesnake Buttes, with a total vertical displacement of 2500 feet in the quadrangle. The hard Dakota sandstone forms the land surface over a large portion of the higher part of the dome. Numerous normal faults occur on the flanks of the uplift, and the resulting intricate displacements are brought out on the geologic structure map by deformation contours. A sharp local dome structure is regarded as probably the result of the intrusion of a laccolithic body of igneous rock emanating from the source of the Spanish Peak intrusion 25 miles to the southwest. These igneous rock are represented in the quadrangle by scattered dikes of rather unusual composition. The petrographic description of these is contributed by Whitman Cross.

G. W. S.

GEOLOGY.—*Geology of the salt and gypsum deposits of southwestern Virginia.* GEORGE W. STOSE. Bulletin 530 (separate N), U. S. Geological Survey. Pp. 14–37. 1912.

The salt and gypsum deposits are in the vicinity of Saltville, Va., and occur in red and gray clays of Mississippian ("Lower Carboniferous") age adjacent to the Rome fault, a great fault thrusting Cambrian dolomite and limestone upon the Carboniferous strata. A section is given of the lower Carboniferous rocks in the syncline adjacent to the fault, comprising the Price sandstone, at the base, Maccrady ("Pulaski") formation, and the Newman limestone, and the equivalence of the

gypsiferous and saline clays to part of the Maccrady formation is discussed. The various theories that have been offered to account for the accumulation of these deposits are described. The fact that the deposits are found only close to the fault and are not known to occur in quantity in the same strata any distance away from the fault, leads the author to the conclusion that disseminated salt and gypsum in the original sediments of earthy limestone, shale, and sandstone, have been concentrated in the same strata adjacent to the fault by circulating waters thru chemical affinity. The ammonia-soda process, which is used in converting the brine of these wells into soda products is described. G. W. S.

GEOLOGY.—*Index to the stratigraphy of North America.* BAILEY WILLIS. Accompanied by *a geologic map of North America*, compiled by BAILEY WILLIS and G. W. STOSE. Professorial Paper 71, U. S. Geological Survey. 1912.

This report summarizes what are regarded as the most authoritative statements concerning the geology of the North American continent. The map, 60 by 77 inches, to which the text is an extended key, is printed in 4 sheets which are folded and encased in a separate box. Its scale is 1 : 500,000 or approximately 1 inch to 80 miles. The 42 color distinctions represent as many divisions of strata. There are distinguished 6 main divisions of the pre-Cambrian, 7 of the Paleozoic, 6 of the Mesozoic, and 7 of the Tertiary. Besides these main divisions larger equivalents in parts of the continent, where details are not known or are too minute to be mapped, are represented by distinct color effect. The color scheme is planned so that the map fulfills two purposes—that of a wall map and of a pocket map. Viewed on a wall only the larger units and the different geologic provinces stand out. The Canadian shield of pre-Cambrian rocks for example is set off sharply from the parallel bands of Paleozoic rocks of the Appalachians, and the lava fields of the western states from the Mesozoic and Tertiary rocks of the Great Plains and the older rocks of the Rocky Mountains. At close range, on the other hand, the more minute subdivisions can readily be distinguished.

To facilitate references in the text, the map is divided into rectangular spaces, each embracing 4 degrees of latitude and 6 degrees of longitude, which are designated by letters and numbers. The text is closely linked to the map by these coördinates, which form the basis of the arrangement of the quotations. Except the explanatory matter in the chapters on introduction and bibliography the descriptions are arranged

in 16 chapters, each treating of one of the major geologic divisions shown on the map. Under each chapter the statements are arranged geographically according to the coördinates, in alphabetic and numerical sequence. Accordingly the geology of any locality where more than one geologic system is represented is distributed thru the various chapters in which those systems are discussed.

The compiler has depended in most cases on the papers quoted to furnish other references to earlier literature. Nevertheless, there are references in the text to 953 separate papers. Each chapter is accompanied by a small sketch map showing the areal distribution of the rocks described in that chapter as represented on the geologic map.

G. W. S.

BOTANY.—*The phylogeny of grasses.* WILLIAM H. LAMB, Forest Service. The Plant World, **15**: No. 11. November, 1912.

This is a discussion of the origin of grasses, the essential differences between the tribes of grasses, and their probable derivation from a common ancestral type.

The grasses have come from lily-like plants by a reduction in the number of the parts of the flower. Among grasses the direction of evolution has been toward a reduction in the number of flowers in the spikelet. Forms with relatively more flowers in the spikelet are to be regarded as primitive, and forms that have but one flower in the spikelet have developed furtherest from the ancestral type.

The first grasses were a primitive group, probably very similar to the bamboos as we know them today, and these are the progenitors, directly and indirectly, of all the other tribes. The Bambuseae have given rise to the other tribes by three great lines of development; the Festucean Line, the Phalaridean Line, and the Andropogonean Line.

A diagrammatic drawing has been made of the spikelet, the inflorescence, and the flower of one genus to typify each tribe, and a chart has been arranged which shows the relationship of the tribes of grasses, and the structural modifications which have segregated each distinct group.

W. H. L.

PLANT PHYSIOLOGY.—*The wilting coefficient for plants in alkali soils.* THOMAS H. KEARNEY. Bureau of Plant Industry, Circular 109, pp. 17–25. 1913.

The object of this investigation was to ascertain whether the presence of an excess of soluble salts in the soil affects the ability of plants to reduce the moisture content to the limit at which plants wilt and are un-

able to regain their turgor unless additional water is supplied (See Bulletin 230, Bureau of Plant Industry, 1912, "The Wilting Coefficient for Different Plants and Its Indirect Determination," by L. J. Briggs and H. L. Shantz). For this purpose wheat seedlings were grown in a series of soils having a graduated salt content, with sodium sulphate as the principal component.

It was demonstrated that the utilization of all "available" moisture in the soil is not prevented by the presence of "alkali" salts unless in quantity sufficient virtually to inhibit the growth of the plants. While the amount of growth made by the plants decreased regularly with the salt content of the soil, their roots, even in the mixture having the highest salt content (0.74 per cent of the dry weight of the soil) in which any growth was made, were finally able to reduce the soil moisture to the calculated wilting coefficient. Absorption was much retarded, however, in the more saline soils, the length of time required for the plants to reach the wilting point having ranged from 18 in the soil having the lowest salt content to 43 in the soil having the highest. T. H. K.

PLANT PHYSIOLOGY. *Some effects of refrigeration on sulfured and unsulfured hops.* W. W. Stockberger and Frank Rabak. Bulletin No. 271, Bureau of plant Industry, Department of Agriculture, pp. 21. 1912.

This bulletin summarizes the results of a comparative study of the effects of cold and ordinary storage on sulfured and unsulfured hops. Trade experts agreed that the samples of sulfured hops in cold storage were best in quality, but differed widely as to the undesirable effect of the treatment upon the other samples.

Determinations were made of the acidity and ester content of the volatile oils extracted from samples of the hops under each condition of storage. The conclusions drawn from these analyses are that both sulfuring and cold storage retard changes in the hops leading to an increase in acidity and ester content of the oils. Cold storage is apparently more effective than sulfuring in retarding the increase in acidity, but is less efficient than sulfuring in retarding increase in ester content. Cold storage and sulfuring combined are much more effective in retarding changes in acidity and ester content than either alone. The percentage of decrease in the content of soft resins was found to be less in the cold-stored hops than in those in ordinary storage. The evidence from the analyses goes to show that the sulfuring tends to retard changes in the content of soft resins only when combined with cold storage.

W. W. S.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE WASHINGTON ACADEMY OF SCIENCES

The 80th Meeting of the Washington Academy of Sciences was held at the Cosmos Club, Wednesday evening, December 18, 1912.

Dr. L. O. HOWARD gave an illustrated lecture on *The danger from imported plants and fruits, and government efforts to avoid it.* The life history of many accidentally imported injurious insects and the ravages they work were illustrated and explained. The best methods of keeping these pests in at least partial control were described. The last Congress passed a law that enables an effective quarantine to be established against insect pests of all kinds.

Dr. Howard also gave an account, which follows in full, of the celebration of the 250th anniversary of the Royal Society of London, to which he was the official delegate of the Academy.

W. J. HUMPHREYS, *Secretary.*

The 250th anniversary celebration of the Royal Society, London, July 15–19, 1912: L. O. HOWARD, Delegate of the Washington Academy of Sciences.

To the President and Members of the Washington Academy of Sciences: I beg to submit a report on the two hundred and fiftieth anniversary celebration of the Royal Society, and in submitting this report beg to express my deep gratitude to the President and to the Board of Managers of the Academy for the appointment as delegate to this extraordinary function, which has given me one of the pleasantest experiences of a lifetime.

In talking recently with one or two members of the Academy, I have been rather surprised to find that they know little of the history of the Royal Society. One of them has even assured me that some time ago he attempted to read up on the subject, but was unable to find a competent historical sketch. Now I have no doubt that if one were to consult that much advertised but none the less reasonably competent Encyclopaedia Britannica full information on this important subject would be found. Since, however, there is undoubtedly a lack of information, it may be well to state briefly, by way of preliminary, certain facts which were brought to the writer's attention in the course of the memorable week following July 15, 1912.

The Royal Society is the oldest scientific society in Great Britain, and one of the oldest in Europe. It is usually considered as having

been founded in 1660, and King Charles II, in fact, approved of its organization in December of that year. A Charter of Incorporation, however, passed the Great Seal July 15, 1662, and it appears that King Charles gave the newly founded society a small grant at that time, which, however, and sad to relate, he was forced to withdraw before the conclusion of his reign. The first Transactions appeared March 6, 1664–65. The headquarters of the Society at the start were in Gresham College, but after the great fire of 1666 meetings were held in Arundel House, at the invitation of Henry Howard of Norfolk.

Isaac Newton was elected a fellow in 1671, and in 1703 was made President, retaining the office until his death in 1727. During his term the Society moved to Crane Court, and in 1780, under the presidency of Sir Joseph Banks, it again removed to apartments set aside in Somerset House, where it stayed until 1857, when it removed to Burlington House, Piccadilly, where it has remained ever since.

In the entire course of its history the Royal Society has been constantly consulted by the government for advice on scientific matters of national importance. Thus the Royal Observatory at Greenwich was in 1810 placed under the sole charge of the Society, and this policy has been continued down to the recent investigations of sleeping sickness and other diseases, conducted under the auspices of this organization.

The Society administers large sums for the promotion of scientific research, possessing an annual grant exceeding twenty thousand dollars for this purpose. Five medals (the Copley, two Royals, the Davey and the Hughes) are awarded every year. The Rumford and Darwin medals are awarded every two years, the latter having been awarded the present year to Dr. Francis Darwin, a son of Charles Darwin, in whose honor the medal was struck. The Silvester medal is awarded triennially, and the Buchanan medal every four years. It is worthy of note that the Buchanan medal this year was awarded to Col. William C. Gorgas, sanitary officer in charge of sanitation of the Panama Canal.

Fellows are elected strictly in accordance with their scientific attainments, except of course in the case of royalty. The admission fee is fifty dollars, and the annual dues twenty dollars, but, by the operation of a fund established in 1878, the admission fee and five dollars of the annual dues have been remitted since that time.

In making preparations for the celebration of this two hundred and fiftieth anniversary, judging by results only, since I am not informed as to the steps which were taken, considerable care was exercised in the selection of the organizations which were invited to send delegates. Apparently only the principal academies of science and the principal universities of the world were invited. At all events, less than three hundred delegates, including those from Great Britain, were in attendance, and among these the United States of America had the largest number. It may be interesting to mention the American delegates

in the order in which they appeared upon the printed diary, programme of proceedings, and list of delegates:

University of California.....Prof. H. C. Plummer
University of Chicago.....Prof. E. B. Frost
Clark University, Worcester.....Prof. Arthur G. Webster
Columbia University, New York.....Dr. N. Murray Butler, President
Cornell University, Ithaca, N. Y.....Prof. J. H. Comstock
Harvard University.....Prof. B. O. Peirce
Johns Hopkins University, Baltimore.....Prof. W. Bullock Clark
Leland Stanford Junior University, California..Prof. Vernon L. Kellogg
University of Michigan.....Prof. William H. Hobbs
University of Minnesota.....Dr. Arthur Hamilton
University of Pennsylvania, Philadelphia. Dr. Edgar F. Smith, Provost
University of Princeton, New Jersey...Prof. John G. Hibben, President
University of Wisconsin.....Prof. Charles K. Leith
Yale University.....Dr. Arthur Twining Hadley, President
American Academy of Sciences, Boston.....Prof. Edwin H. Hall
Connecticut Academy of Arts and Sciences.. Prof. W. E. Brown, F.R.S.
American Mathematical Society, New York..Prof. H. B. Fine, President
American Philosophical Society, Philadelphia
Prof. W. B. Scott, Vice-President.
Franklin Institute, Philadelphia.....Major G. O. Squier
California Academy of Sciences, San Francisco....Mr. Joseph D. Grant
Carnegie Institution, Washington.....Dr. R. S. Woodward, President
National Academy of Sciences, Washington
Dr. Arnold Hague, Secretary
Smithsonian Institution, Washington.....Dr. Arnold Hague
Washington Academy of Sciences.....Dr. L. O. Howard

On Monday night, July 15, 1912, exactly 250 years from the date of the passage of the Charter by the Great Seal, Burlington House, become famous during the last 65 years from the notable social and scientific functions of the Society, was brilliantly illuminated, and the delegates assembled, many of them just from their steamers and trains, for the purpose of registration and for informal meeting and the making and renewal of acquaintance.

The first formal function took place the next morning, Tuesday, the 16th, at Westminster Abbey. The heat of the day was excessive. It would have been excessive even in Washington, and in London it was almost overpowering. The majority of the delegates wore academic dress, and the service was attended by many distinguished Englishmen high in rank or in political service, one of the naves of the cathedral being reserved for delegates, the remainder of the space being filled by London society. Addison's superb hymn, "The Spacious Firmament on High," was sung by the choir, and, while appropriate to the occasion

in other respects, brought a smile to the lips of the American delegates when the words were chanted.

> The unwearied sun, from day to day,
> Does his Creator's power display,
> And publishes to every land
> The work of an almighty hand.

The service was impressive in the extreme, and most significant was the short address of the Dean of Westminster based on the passage "But truth abideth and is strong forever." He recalled the perturbation which was wont to take possession of men's minds during the last century with regard to discoveries in natural science—perturbation which sometimes betrayed itself in fear, impatience and indignation; but times were now changed; he thought that he might claim to speak in the name of the whole world of contemporary Christian thought when he gave expression to the gratitude, which as a rule the clergy has little or no opportunity for offering, for the amazing enrichment of human thought which had resulted from patient researches into natural science during the past 250 years, and in particular during the past 80 years. They thanked God for the great and glorious work that had been done by the men of science for the widening of human thought; with all humility they expressed their grateful obligation for the benefits which had been rendered in Great Britain by the Royal Society.

In the afternoon of Tuesday, delegates were received in the great library of the Royal Society, Burlington House. Sir Archibald Geikie, the President, was accompanied by Lord Rayleigh, Past President; Sir A. B. Kempe, Treasurer; Sir Joseph Larmor, and Sir J. R. Radford, Secretaries; and Mr. Robert Harrison, Assistant Secretary. The majority of delegates wore official robes or academic dress. Among the scarlet doctors' gowns were prominent the crimson and gold cloaks of some of the German professors, the claret and gold uniform with brown fur cloak of a Hungarian delegate, the inconspicuous but rather bizarre olive-green uniform of members of the French Academy, and the silk robes and turbans of the Indian representatives. The heat again was almost overpowering, and, although the library is called "the Great Library" the 300 delegates were so closely crowded that it required the intense interest of the function to overcome the feeling of personal discomfort.

Sir Archibald Geikie, the President, in welcoming the delegates, was necessarily obliged to make the rather trite but none the less true observation that no more striking proof than was presented by this assembly could be given of the reality and cordiality of that spirit of frank and loyal coöperation which united into one great brotherhood the students of science in every land and in every language. He reviewed the events which led to the grant of the Charter of Incorporation by Charles II, and mentioned some of the famous names of men associated with the Royal Society and with the progress of science. Starting its career with a notable group of physicists and mathematicians, among whom

were Robert Boyle and John Wilkins, it before long welcomed Isaac Newton into its ranks, published his immortal "Principia," and annually elected him as its President for nearly a quarter of a century. He called attention to the fact that the physical sciences had all along been strongly represented in the Society. It seemed but yesterday, he said, that James Clerk Maxwell's voice was heard in those rooms and that Stokes and Kelvin sat in the presidential chair; that the succession of leaders was still well maintained, he called attention to the presence that day of Lord Rayleigh, Sir William Crooks, Sir Joseph Thomson, Sir Joseph Larmor, and any others. Nor had the biological sciences been less prominent in the work of the Society. From the early days of John Ray down to those of Charles Darwin, Hooker, Huxley and Lister, every branch of biology has been illustrated and advanced by the fellows of the Society.

The ceremony of presenting addresses of congratulation followed. Aside from the formal addresses there were speeches of complimentary character from a representative of each country. For America, Prof. W. B. Scott, of Princeton, as Vice-President of the American Philosophical Society, was selected. A notable incident of this function was the presentation to the Society by the German academies and societies of a large bronze tablet commemorative of the work of the Royal Society and of the admiration held for it in Germany. This tablet is to be set into the walls of the Library at Burlington House.

At night on Tuesday a banquet took place at the Guildhall. The delegates were all present, and hundreds of men prominent in most walks of life in England graced the function by their presence. A glance over the table list shows many familiar names, from which are culled here and there a few which may be of especial interest to members of the Washington Academy: Lord Allerton, Lord Alverstone, the Archbishop of Canterbury, the Archbishop of York, Mr. Asquith the Premier of England, Mr. Balfour, Cardinal Bourne, Mr. Francis Darwin, Sir George H. Darwin, the Dean of Saint Pauls, the Dean of Westminster, Prince Ahmed Fouad Pacha, Prince Boris Galitzin, Sir Archibald Geikie, Lord George Hamilton, Mr. Rudyard Kipling, Lord Morley, the Duke of Northumberland, Sir William Osler, Sir William Ramsay, Lord Rayleigh, Lord Reay, Hon. Walter Rothschild, Professor Schaefer President of the British Association for the Advancement of Science, Lord Strathcona, Lord Sudeley, Lord Tennyson, Sir William Thisleton-Dyer, Sir J. J. Thomson, and Sir. J. I. Thornycroft.

Wherever one glanced around the assemblage his eye fell upon some man of world-wide fame.

At the conclusion of the dinner there was an extraordinary list of toasts and responses. The word "toast-master" in England at a function of this kind has a different significance from the term as applied in this country. There the toast-master is literally an announcer of toasts. On this occasion he was a very large man with a very large voice, who announced in stentorian tones at the request of the presiding officer the toasts which were to be drunk, invariably beginning "My lords and gentlemen."

A notable speech was that of Mr. Asquith, Prime Minister of England. It was historical in large part. One sentence which aroused laughter was as follows: "When the universities were ingrossed in the din of civil war, 'to the neglect,' as a contemporary writer says, 'of academical studies,' science and philosophy took refuge in the comparative peace and tranquility which the streets of the City of London could then afford." Another pleasantry of the Prime Minister's was given in the following words; "In the same roll with John Dryden is one of the chief victims of his satire, George Villiers, Duke of Buckingham, who, amid his various qualifications for the chief office of state, was as we know 'chemist, fiddler, statesman, and buffoon,' and I see from your records that history tells us that when this, perhaps the most original of the original fellows of the Royal Society was committed to the tower, a special laboratory was fitted up for him in order that he might practice chemistry; and, according to Bishop Burnet, he was 'nearly' successful in discovering the philosopher's stone—an illustration which suggests that some people might be more profitably employed at present than at either Westminster or Whitehall."

Characteristic of the address of the Prime Minister was the frank acknowledgment of the benefits derived by government from the work of men of science. The administration of the grants of the Royal Society is not, he said, a benefit conferred on the Society by the State, but a service conferred on the State by the Society.

That distinguished scholar and late eminent politician, Lord Morley, proposed the toast of universities at home and abroad, and his address was a most scholarly and able production.

The Archbishop of Canterbury proposed the toast of the learned societies in the old and new world, and called attention to the significance of the fact that this toast had been entrusted to an ecclesiastic. He called attention to the fact that Smithfield and St. Paul's Cross were very near to the Guild Hall, and he believed that the time might be found when, if under that roof or under the roof which preceded it, they had seen a great gathering of orthodox ecclesiastics together with a gathering of adventurous students of science, they might have agreed that they were on the way to Smithfield, that the one might see the other suffer.

One of the speakers at this historic dinner was a member of this Academy, Dr. R. S. Woodward, President of the Carnegie Institution of Washington.

The morning of Wednesday, July 17, was devoted to visits to places of interest in London, including the Zoological Gardens, the British Museum, the Natural History Museum, Victoria and Albert Museum, Lambeth Palace, and Westminster Abbey. The most perfect arrangements were made for the entertainment of the ladies accompanying visiting delegates, and during this and the following mornings arrangements had been made for small parties to see many of the famous private houses of London, and a special reception was held in their honor.

In the afternoon of this day the Duke and Duchess of Northumberland gave a garden party at Syon House on the Thames, about eight miles from Hyde Park Corner—Syon House, one of the famous houses of England, with beautiful grounds, containing a wealth of art. Hundreds of London society people also attended the garden party.

In the evening one of the famous conversaziones of the Royal Society was held at Burlington House. The contrast between a conversazione of the Royal Society, from the social point of view, and one of the social functions of the Washington Academy of Sciences is striking to say the least. Wealth, beauty, and nobility abound at the one, while at the other the list is restricted to scientific attainments and personal beauty.

At Burlington House on Wednesday night, among other interesting exhibits, there were shown the chronometer by Arnold, used by Captain Cook on his second and third voyages; an electrical machine constructed by Doctor Joseph Priestley, the original model of Sir Humphrey Davey's miner's safety lamp, a pair of compasses which belonged to Sir Christopher Wren, and Newton's original account of his reflecting telescope.

Thursday morning also was devoted to specially conducted visits to points of interest, and in the afternoon His Majesty the King, Patron of the Royal Society, and Her Majesty the Queen received the President and Council of the Royal Society and the delegates at Windsor Castle. This was a function that commanded especial interest from the foreign delegates, and, curiously enough, especially from those coming from countries whose governments are of the republican form. The invitations alone, issued by the Lord Chamberlain at the command of their Majesties, and the cards of entrance signed by Chesterfield, Lord Steward, were sufficiently novel to the republicans to demand their vivid interest. Special trains from Paddington Station took the delegates to Windsor, and on their arrival at the famous castle they were conducted through the rooms by Lord Chesterfield, and eventually formed in line upon the Rose Terrace. Finally the King and Queen appeared descending the staircase, and stood alone at its foot. Several personalities, including King George of Greece, stood carelessly upon the staircase above watching the proceedings. The delegates, 300 in all, were grouped according to countries, and passed in single file, each receiving a warm grasp of the hand and some of them a pleasant word or so from both the King and Queen. One of the members of the Washington Academy of Sciences, namely Major Squier, now military attaché to the United States Embassy at London, and on this occasion representing the Franklin Institute of Philadelphia, received an especial word of greeting from the King, with whom he had had a long personal interview a few days before on his arrival in London to assume his diplomatic position.

Following this reception by the King and Queen, the delegates descended to the gardens below, where a gigantic garden party, attended

by nine thousand of England's best, was assembling. It was a beautiful day; the weather had grown milder although still bright and sunny. The wonderful of green the English trees and turf—the brilliant colors of the summer costumes of the women—the variegated refreshment marquees—the beautiful strains from several military bands—the sound of the charming English voices as one passed from group to group—the feeling that one had that he was mingling with the best that England could produce in culture, in scientific attainment and social position—altogether produced an exalted condition of mind not to be forgotten.

This royal reception at Windsor brought the celebration to a close so far as the official arrangements of the Royal Society itself were concerned, but, realizing that among the fellows there was a strong desire to offer to their guests from foreign lands and from the British dominions over the seas some less formal and more intimate hospitality, a numbers of the fellows gave private dinners, more or less especially to include those guests who brought their wives and daughters with them, while the Royal Society Club invited the rest of the foreign and colonial delegates to dine at the famous Trocadero Restaurant. At this last dinner no speeches were made.

On Friday visits were made to Oxford or Cambridge, as the delegates preferred. Convocations were held at each of the universities, and luncheons were given to the guests. At both universities honorary degrees were conferred, and at Oxford, among others, Dr. W. B. Scott, Blair Professor of Zoology and Paleontology in Princeton University, was given the honorary degree of Doctor of Science. At Cambridge Dr. E. B. Frost, Director of the Yerkes Observatory, among others, was given the same honorary degree.

The writer had on previous occasions met with the charming hospitality of the English, and he had had opportunity to witness their genius in the organization of scientific meetings and international congresses and celebrations; but never had he met with such perfection of arrangement, such wealth of hospitality, and never had he been given such an insight into many of the qualities which place the England of today in the high position which she occupies among nations as on this occasion, and he dare not hope for another similar opportunity in one lifetime.

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

The 464th regular meeting of the Anthropological Society of Washington, D. C., was held December 17, 1912, at the National Museum, the President, Mr. Stetson, in the chair.

Prof. C. V. PIPER read a paper on *The Filipinos and the problem of their government.* He began with a general résumé of the insular conditions and various peoples dwelling there, of whom he said the Negritoes, now found mainly in four islands but once in nearly all, are generally regarded as the original inhabitants, the Igorrotes and other wild tribes

being the next to arrive, the Filipinos next, perhaps about 500 A.D. and the Moros last, about the time of the Spanish occupation. At some length he described the Filipino characteristics, distinguishing between the small educated minority and the majority of ignorant laborers. The most remarkable thing we are doing there, he said, is the attempt, for the first time in history, to educate an inferior people en masse. The Asiatic European colonies have little faith in its success.

DR. RILEY B. MOORE read a paper on *Observations in St. Lawrence Island.* This island in the Bering Sea includes one hundred by thirty miles of treeless swamp and tundra inhabited by some two hundred and fifty people, the débris of five different tribes. Some of these resemble Sioux Indians; others are typical Mongolians, with all intervening kinds. In summer they have a profusion of birds and fish to feed on; but in other seasons their food is whale-meat, seal-meat and walrus-meat. They live with little ventilation and suffer from many skin diseases. Tuberculosis also is very common. The death rate has long exceeded the birth rate.

WM. H. BABCOCK, *Secretary.*

THE CHEMICAL SOCIETY OF WASHINGTON

The 217th regular meeting was held on October 10, 1912, at the Cosmos Club. The general subject for the evening comprised reports on the meetings of the Eighth International Congress of Applied Chemistry. President LE CLERC reported on the international meetings, addressed by Bertrand, Duisberg, Eyde, Perkin, and Ciamician. Experiments were shown by the speaker illustrating Perkin's success in fire-proofing cotton fabrics.

F. K. CAMERON reported on agriculture and silicate industries. The most important papers of the Congress, in his opinion, were concerned with the fixation of nitrogen. F. W. CLARKE reported on atomic weights and sketched the history of the International Commission. W. D. BIGELOW summarized the papers on bromatology and hygiene, paying especial attention to those on analytical methods, metabolism, and preparation of foods. H. E. PATTEN reviewed the electrochemical papers in all the sections. The papers on dust collection, sulfuric acid, and new alloys of tungsten and the iron group were given especial attention by A. L. DAY in reviewing the sections on inorganic and physical chemistry. Finally, C. E. MUNROE spoke very interestingly of new developments in explosives brought out in the section on that subject.

A special meeting was held on October 24, 1912, at the Cosmos Club. The following papers were read:

Moisture determination by means of calcium carbide: H. C. MCNEIL. The apparatus used was briefly described and examples of determinations in a wide variety of substances were given. The method gives results concordant within 0.2 per cent on quantities of the order of 15 per cent. Discussion by Tolman.

Study of changes taking place in the conversion of cider into vinegar: L. M. TOLMAN The conversion of a large quantity of cider into vinegar was followed in a large factory in Michigan. The only important change that occurs is the conversion of the alcohol into acetic acid, the other substances present remaining nearly the same. The raw material, altho varying from year to year, is remarkably uniform in composition in a given year. No general conclusions can be drawn from analyses of home-made vinegars, which vary quite widely.

In the discussion by Gore the fact was brought out that the yield is about 73 per cent of the theoretical. Alsberg and Seidell also discussed the paper.

Potassium ammonomagnesate and potassium ammonobarate: E. C. FRANKLIN. The ammonia system of acids, bases, and salts was outlined, and the analogy carried on into the amphoteric compounds of zinc, lead, etc. But cuprous copper, thallium, barium, and magnesium also act as amphoteric elements in the ammonia system, and the salts named in the title are among those recently prepared. The speaker showed the apparatus and described the methods of manipulating these compounds. Discussion by Foster, Johnston and Cameron.

The 218th regular meeting was held on November 14, 1912, and was devoted to the election of officers for 1913 as follows: President, C. E. WATERS, Bureau of Standards; First vice-president, M. X. SULLIVAN, Bureau of Soils; Second vice-president, C. L. ALSBERG, Bureau of Plant Industry; Secretary, R. B. SOSMAN, Geophysical Laboratory; Treasurer, F. P. DEWEY, Bureau of the Mint; Councilors, C. L. ALSBERG, Bureau of Plant Industry; S. F. ACREE, Johns Hopkins University; P. H. WALKER, Bureau of Chemistry; J. A. LE CLERC, Bureau of Chemistry; Executive Committee, J. JOHNSTON, Geophysical Laboratory; E. W. BOUGHTON, Bureau of Chemistry; R. C. WELLS, Geological Survey; E. C. MCKELVY, Bureau of Standards.

ROBERT B. SOSMAN, *Acting Secretary.*

The 219th meeting was held jointly with the Baltimore Branch of the American Chemical Society in Hokpins Hall, Baltimore, on November 30, 1912. The following papers were read:

The inflammability of coal dust: J. C. W. FRAZER. Discussion by C. Caspari, Jr., W. A. Randall, B. F. Lovelace, Marshall, Roundtree, and J. A. LeClerc.

The United States Pharmacopoeia, its origin, history and requirements: CHARLES CASPARI, Jr. Discussion by Englehardt and Le Clerc.

C. P. VAN GUNDY, *Secretary pro tem.*

The 220th meeting of the Chemical Society was held 12 December, 1912, at the Cosmos Club. President-elect C. E. Waters was elected vice-president of the Washington Academy to represent the Society. The following papers were read:

R. B. DOLE of the Geological Survey: *The concentration of mineral waters in relation to their therapeutic activity.* The efficacy of the waters

of health resorts usually arises from other causes than the composition of the water. The reactions of substances usually present in the mineral waters are those of the positive or negative salt radicals. Their effect can therefore be predicted by the experimental use of single pure salts in solution at known concentrations. The following phenomena interfere with simple deduction from such experiments: (1) cumulative effects of certain radicals; (2) "toleration" acquired against certain radicals; (3) "interference" of different radicals in the same water. Examples of very concentrated waters in common use in the West were cited, to show that waters having concentrations well above the normally active physiological dose could be used for years with no appreciable effect.

F. C. Cook, of the Bureau of Chemistry: *A comparison of plant, meat, and yeast extracts.* The paper was concerned largely with methods, and can not be briefly abstracted.

Discussion: Alsberg suggested that removal of ammonia or presence of some unrecognized compound would result in better agreement between the Van Slyke and Soerensen methods for hydrolyzed proteins. M. X. Sullivan discussed the presence of small amounts of creatinin in plants, probably too small to affect the test for distinguishing plant from meat extracts. E. C. Franklin also discussed the paper.

A. S. Cushman and E. B. Wettengel of the Institute of Industrial Research: *The electrolytic determination of tin in canned food products.* Read by Mr. Wettengel. The usual gravimetric method for tin is tedious and expensive. The electrolytic method is much simpler and shorter and was shown by thoro tests to give reliable results. The pulped material is digested with acid, neutralized with ammonia and ammonium sulfide, freed from insoluble matter, and electrolyzed hot, using a rotating cathode. Discussion by Taber and Smith.

A. Seidell of the Hygienic Laboratory and F. Fenger of Armour and Company: *Seasonal variation in the iodine content of the thyroid gland.* Read by Seidell. A parallelism exists between the iodine content and the physiological activity of commercial thyroid as used in medicine. A standard commercial concentration of 0.2 per cent has been recommended. In order to obtain data upon the raw material used in manufacturing commercial desiccated thyroids, and to study the possibility of meeting such a standard, Mr. Fenger collected samples at Chicago from sheep, hogs, and cattle at two-week periods, each representing about 300 animals. Maxima of iodine were found in all three between September and November, and minima in summer. A rather variable ash content was found due to the wear of the ball mills.

Discussion: Waters suggested that the iodine content varied with the amount of green food. Seidell believed this was not the only cause of variation. Dole suggested a geographical variation, which was admitted as a possible explanation in spite of the large number of samples. Alsberg added further evidence of a geographical variation. Bunzel quoted the determinations of Koch to show a seasonal variation. Dole

stated that no potable waters in this country have enough iodine to have any effect in preventing goitre, if a lack of iodine is the cause of that disease. Cook quoted his analyses of corals, showing a selective absorption of iodine by these organisms.

ROBERT B. SOSMAN, *Acting Secretary.*

THE BOTANICAL SOCIETY OF WASHINGTON

The 85th regular meeting of the Botanical Society of Washington was held at the Cosmos Club, Tuesday evening, January 7, 1913. The following scientific program was presented:

DR. DAVID GRIFFITHS: *Performances in species of opuntia* (illustrated with lantern slides). This paper will be published in the near future as a bulletin of the Bureau of Plant Industry.

MR. J. B. NORTON: *Some interesting facts concerning the genus Asparagus* (illustrated with lantern slides). This paper gave a review of features connected with the work of breeding a rust resistant variety of asparagus. *Asparagus officinalis* has never been found to be completely immune to the attacks of its rust, *Puccinia asparagi*. Plants nearly immune to the destructive summer stages show no resistance to the aecidial stage of the fungus. Resistance seems to be due to morphological causes. Related species are attacked by the rust but the members of other sections of the genus seem immune. The genus Asparagus and its relatives are entirely limited to the old world, the majority being African. A study is being made of the relationships of this group and many new characters based on the manner of growth, roots, stems, leaf scales, cladodes, etc., have been found. The arrangement of the stomata on the cladodes is very characteristic in the various groups. The old genus Asparagus contains several very distinct groups of species entitled to generic rank.

Only one hybrid form of known parentage has been secured, a cross between *A. officinalis* and *A. davuricus*. Many other combinations have failed to produce seed. Asparagus grows rapidly,—some species average nine inches per day. The seed germination takes from twelve days with *officinalis* to sixty or more days with some African species. Several new ornamental forms were described.

C. L. SHEAR, *Corresponding Secretary.*